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Selection and Application of a One-Dimensional Non-Darcy Flow Equation for Two-Dimensional Flow through Rockfill Embankments[1]

by

H. CHANSON[2]

The writer would like to congratulate the authors for their interesting investigations. For completeness, he wishes to comment on the results' application.

Flows through rockfill embankments can be used in some cases to reduce the peak flow as discussed in the article. There are however other applications of seepage flows through rockfill structures.

1- Flow through a rockfill dam is a type of flood water release (i.e. spillway use). It can occur with concrete-faced rockfill (CFR) dams or with in-built spillway dam (fig. 1). Several researchers (e.g. PARKIN et al. 1966, OLIVIER 1967) discussed the interactions between the seepage flow through the rockfill and the overflow. In Australia, rockfill dams with in-built spillways have been used since the 1950's. ALLEN (1984) and LAWSON (1987) described several prototype experiences.

2- Flow through a rockfill embankment might occur also during the construction of a rockfill structure (e.g. a dam). The main concern becomes then the stability of the structure. Provided that the downstream slope of the structure is undamaged, LAWSON (1987) showed from prototype experiences that large flood flows can be passed through (and over) the partly-completed embankment. The downstream slope can be reinforced with bars and anchors to improve the downstream slope stability.

3- Further rockfill structures are used as debris barriers. These can be made of dumped rockfill, timber cribs filled with rock and earth, or gabions (e.g. fig. 2). At low and medium flows, the waters pass through the embankment while debris material are trapped upstream. For large runoff, it is usual to make provision for an overflow structure. A stepped overflow geometry enhances the rate of energy dissipation reducing or eliminating the need for a downstream dissipation structure (CHANSON 1995).

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[1]HANSEN, D., GARGA, V.K., and TOWNSEND, D.R. (1995), *Can, Geotech. Jl*, Vol. 32, pp. 223-232.

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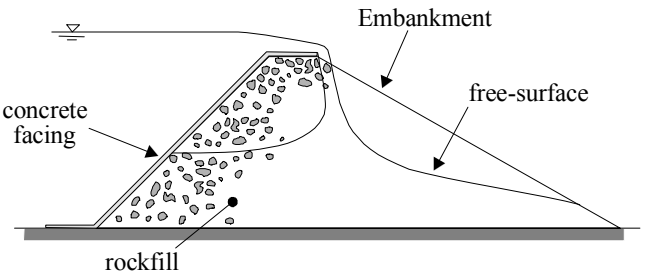
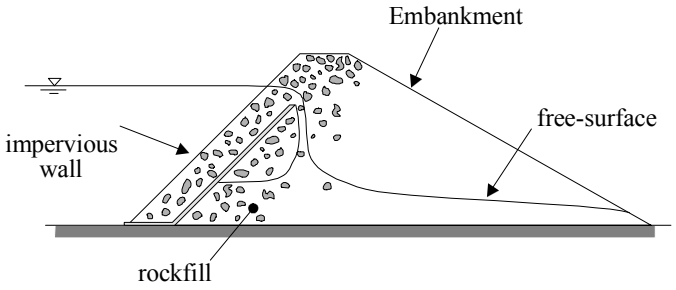
Fig. 1 - Examples of seepage flows through rockfill dams



Concrete-faced rockfill dam



In-built spillway rockfill dam

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Fig. 2 - Gabion debris dam with overflow stepped spillway (dam height : 5 m, step height : 1 m), Congohas, Brazil (1987) (Courtesy of Officine Maccaferri) - Note the colour of the flow indicating large soil-debris contents